

charge which I make against Prof. Claus. What I complain of is that he stated to the Vienna Academy that "hitherto" other views were held by zoologists, and that the views then announced by him were *novelties*. As a matter of fact they were not novel, but had been in so many words and in identical terms formulated by me five years before, and published as a special essay in a journal habitually studied by Prof. Claus. Moreover, these views were not obscurely hinted at by me in scattered passages of a treatise definitely supporting other and antagonistic views, but were all enunciated in logical sequence and made the subject of special discussion and investigation in the essay alluded to, "*Limulus* an Arachnid." This publication Professor Claus chooses to ignore in claiming novelty for the views published by him in the 'Anzeiger' five years after its appearance.

I leave the reader to classify the conduct of Prof. Claus in thus dealing with the published work of his contemporaries.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

January 27, 1886.—Prof. T. G. Bonney, D.Sc., LL.D., F.R.S.,
President, in the Chair.

The following communications were read:—

1. "On the Fossil Mammalia of Maragha, in North-western Persia." By R. Lydekker, Esq., B.A., F.G.S., &c.

The Author alluded to the important memoirs of Messrs. Grewingk, Pohlig, and Rodler on the Maragha Mammalia, and having expressed the hope that his notice would be regarded as an attempt to assist rather than to interfere with their work, mentioned a collection of specimens from Maragha sent by Mr. Damou to the British Museum. He fully confirmed the conclusions already arrived at as to the identity of many of the Maragha mammals with those of Pikermi, and thought that *Giraffa attica*, *Palæoryx Pallasi*, *Sus erymanthius*, *Mastodon pentelici*, and *Helladotherium Duvernoyi* might be added to the list of species already recorded. He also recorded the French *Felis brevirostris*; a *Rhinoceros*, apparently allied to *R. antiquitatis*; and *R. Blanfordi*, of the north-west portion of India and China. The paper concluded with some observations regarding the relations of the Palæaretic and Oriental Pliocene faunas.

2. "On the Pliocene of Maragha, Persia, and its resemblance to that of Pikermi, in Greece; on Fossil Elephant-remains of Caucasia and Persia; and on the results of a Monograph of the Fossil Elephants of Germany and Italy." By Dr. H. Pohlig. Communicated by Dr. G. J. Hinde, F.G.S.

The principal object of the Author in making a geological tour

through part of Persia, in 1884, was the exploration of a deposit containing Pliocene mammals, discovered thirty years ago near Maragha, east of Lake Urumia, by Göbel and Khanikoff. The first part of the present paper gives a brief account of the results of this exploration, together with a list of the fossils.

The ossiferous deposits near Maragha are of fluvio-lacustrine origin, and consist chiefly of reddish marls, similar to those of Pikermi, and formed from the detritus of the volcanic mountain of Sahend. These Pliocene beds rest upon horizontal Cretaceous strata, and pass upwards into Pleistocene deposits with erratic blocks.

In the list of fossil Mammalia it is shown that several are the same as Pikermi forms. A *Hipparion*, probably identical with *H. gracile*, is the most abundant. The supposed occurrence of Pleistocene forms, such as *Rhinoceros tichorhinus*, associated with the Maragha Pliocene fossils, is probably an error.

The second part of the paper contains notes on specimens of *Elephas primigenius*, chiefly in the Museum of Tiflis. The third part gives very briefly the principal results of the Author's examination of Pleistocene Proboscidea in the various museums of Europe, especially in those of Germany and Italy, and concludes with his views with respect to *Elephas antiquus*, *E. melite* (which he considers a dwarf form of *E. antiquus*), *E. meridionalis*, *E. hysudricus* (which the Author considers identical with *E. meridionalis*), *E. primigenius*, and a few other species, one of which is believed to be new.

February 10, 1886.—Prof. T. G. Bonney, D.Sc., LL.D., F.R.S.,
President, in the Chair.

The following communication was read:—

“On a new Species of *Psilotites* from the Lanarkshire Coal-field.”
By R. Kidston, Esq., F.G.S.

The specimen described, which was found by Mr. Walter Burns in 1884, consists of three parallel branchlets with thorn-like projections on one side only. The Author describes these as a form of Goldenberg's genus *Psilotites*, and points out that they have much resemblance to Dawson's *Psilophyton*.

March 24, 1886.—Prof. J. W. Judd, F.R.S.,
President, in the Chair.

The following communication was read:—

“On the Genus *Diphyphyllum*, Lonsdale.” By James Thomson,
Esq., F.G.S.

The Author commenced by giving a definition of the genus *Diphyphyllum*, and then proceeded to discuss its relations with some allied forms, such as *Lithostrotion*, *Lithodendron*, and *Campophyllum*. *Diphyphyllum* was shown to be restricted in Scotland to the lower portion of the Carboniferous system, and not to have survived the great development of volcanic action in the upper part of the

Carboniferous-Limestone series, whereas in Belgium and elsewhere the range of this genus was more extensive.

It was shown that in *Diphyphyllum* reproduction took place both by fissiparity and by calicular gemmation, examples of both forms being cited. It was also pointed out that the development of central vertical plates, showing a tendency to a passage into *Lithostrotion*, was due to the corals having lived in a sea periodically affected by the influx of sediment from the neighbouring shore.

After a history of the views held by different writers since Lonsdale, and especially by M^cCoy, Milne-Edwards and Haime, Hall, Billings, and De Koninck, on corals referred to this generic type, the author gave a description of the species found in North Britain; and after pointing out their differences, showed that all exhibit a tendency to vary, and that, if a sufficient series were available, a passage might be traced not only between the different species, but between *Diphyphyllum* and the various allied genera.

April 7, 1886.—Prof. J. W. Judd, F.R.S.,
President, in the Chair.

The following communications were read:—

1. "On a Lower Jaw of *Machærodus* from the "Forest-bed," Kessingland." By James Backhouse, Esq., F.G.S.

The Author believed that hitherto no example of a lower jaw of *Machærodus* has been met with in this country; he consequently gave a detailed description and measurements of a right mandibular ramus obtained by him from the Forest-bed at Kessingland, in Suffolk. Owing to the imperfect condition of the incisors and canines, it was impossible to say whether these teeth were serrulated or not, and consequently it was uncertain whether the bone belonged to *Machærodus cultridens* or *M. latidens*.

2. "A Contribution to the History of the Cetacea of the Norfolk "Forest-bed." By E. Tulley Newton, Esq., F.G.S.

This paper was principally devoted to the description of two fossil specimens. The first of these was a tooth, shown by external and microscopical characters to have belonged in all probability to the Sperm-whale, *Physeter macrocephalus*. The specimen was obtained by Mr. Clement Reid, at Sidestrand. The second fossil, also from Sidestrand, and now in the possession of Mr. James Backhouse, consisted of the right half of the seven anchylosed cervical vertebræ of a species of *Balæna*. The specific determination was less certain in this case; but the form approached most nearly to that of *B. biscayensis*. Of other vertebræ from the Forest-bed, one, a caudal, was referred to *Balæna*; another, from the lumbar region, to *Balænoptera*.

May 12, 1886.—Prof. J. W. Judd, F.R.S.,
President, in the Chair.

The following communications were read:—

1. "On the Maxilla of *Iguanodon*." By J. W. Hulke, Esq., F.R.S., F.G.S.

Two fragments, together representing nearly the entire left maxilla of a species of *Iguanodon*, have been found at Cuckfield, the locality whence the first tooth of the genus was obtained by Dr. Mantell, about 1820. These fragments, measuring together 29 centimetres, and exhibiting 19 alveoli in the dentary border, were described in the paper. It was shown that the upper jaw in question probably belonged to *Iguanodon Mantelli*. In addition to the detailed characters described, the maxillæ of *Iguanodon* and *Hypsilophodon* were compared, and their distinctions explained.

2. "Notes on the Distribution of the Ostracoda of the Carboniferous Formations of the British Isles." By Prof. T. Rupert Jones, F.R.S., F.G.S., and J. W. Kirkby, Esq.

Although all the Ostracoda of the Carboniferous Formations are not yet described, there are 170 species and notable varieties known, belonging to 33 genera of 9 families. About 25 of these species, not yet described, but determined by the Authors, are introduced into their lists as giving a fuller idea of the value of this manifold Crustacean group.

In the first place they referred to the classification of the Carboniferous strata in Scotland and in England, according to the local differences, taking in succession "Scotland West," "Scotland East," "England North, with the Isle of Man," "England Central and South, with South Wales," as the several districts from which they have obtained good groups of Ostracoda from different members of the Carboniferous series.

In Fife, the lowest local Carboniferous strata contain *Beyrichia subarcuata*; higher up come in *Carbonia fabulina*, *C. Rankiniana*, *Bairdia nitida*, and *Leperditia Okeni*; the last, accompanied by other species, occurs throughout this lowest series, in which the record is more complete than in Midlothian and Linlithgowshire, where the same species also occur. In Dumfriesshire and Ayrshire *Leperditia Okeni* and *L. subrecta* have been found in beds even lower than those above mentioned, and are therefore probably the oldest Carboniferous Ostracoda; other species accompany them higher up, and in Roxburghshire some localities of the Calciferous-Sandstone series are very rich in species. The Carboniferous-Limestone series of S.W. Scotland has been highly productive of Ostracoda, particularly the shales of the lower beds; 36 species are common or characteristic. The middle or coal-bearing portion has yielded but few, chiefly *Leperditia Youngiana*, one *Beyrichia*, *Carbonia fabulina*, and *C. Rankiniana*. The Upper-Limestone group contains many recur-rents from below and a few others, including *Youngia rectidorsalis*.

The Millstone-Grit equivalents have no Ostracoda ; but the overlying Coal-measures are rich in *Carboniæ*, with a few others, such as *Cypridina radiata*.

A great variety of genera and species come from beds at or near the base of the Scar Limestone and its equivalents in North Lancashire, Westmoreland, Cumberland, and Northumberland. The calcareous shales of the Yoredale series have several interesting forms, including *Phreatura concinna* ; none from the Millstone-Grit.

The Lower Coal-measures give *Beyrichia arcuata* and *Carbonia*, sp. The middle beds have *B. arcuata* and *Carbonia fabulina*, common ; rarer, *C. Rankiniana*, *C. secans*, *C. scalpellus*, *C. Wardiana*, and *Philomedes elongata*. In the Upper Coal-measures *B. subarcuata* reappears ; and in the *Spirorbis*-limestone *Leperditia inflata* is the latest Carboniferous Ostracod in England.

In Northamptonshire the deep Gayton boring (at 730 feet) has given *Kirkbya variabilis*, *K. plicata*, *Bythocypris sublunata*, *Macrocypis Jonesiana*, *Cytherella extuberata*, and *C. attenuata*, all but one belonging to the Lower-Carboniferous series. In Salop, South Wales, and Somerset the Carboniferous Limestone has yielded several good species of *Leperditia*, *Kirkbya*, *Moorea*, *Bythocypris*, *Bairdia*, &c. *Carbonia Agnes* and *C. Evelinæ* belong to the South-Welsh Coal-measures.

The distribution of the Carboniferous Ostracoda in Ireland requires further work ; but the Lower-Carboniferous Shales and the Mountain Limestone near Cork and elsewhere are very rich, as are also some parts of the latter in the Isle of Man.

The Ostracoda of the Permian Formation were then treated of in relation to their Carboniferous allies, and the range of the British Carboniferous Ostracods in Europe and North America was noticed in some detail.

The results of the examination were shown in two extensive tables.

3. "Note on some Vertebrata of the Red Crag." By R. Lydekker, Esq., F.G.S.

This communication contained briefly the results of a reexamination of the specimens from the bone-bed of the Red Crag in the British and Ipswich Museums, a series of casts from the latter having been added to the former. The forms noticed were *Hycena striata*, with which *H. antiqua* and *H. arvernensis* were considered probably identical ; *Mastodon*, of which the author thought three species, *M. arvernensis*, *M. longirostris*, and *M. Borsoni* were represented ; *Sus*, of which two forms, the larger probably *S. erymanthius* or *S. antiquus*, the smaller *S. palaeochærus*, had been detected ; a Tapir, which was probably *Tapirus arvernensis* or *T. elegans* rather than *T. priscus* ; *Hipparion gracile* ; a *Rhinoceros* referable to the hornless *R. incisivus* rather than to *R. Schleiernmacheri*, though the latter probably also occurred ; and a species of Albatross (*Diomedea*), represented by a right tarso-metatarsus, and the associated proximal phalangeal bone of the fourth digit.

June 23, 1886.—Prof. J. W. Judd, F.R.S.,
President, in the Chair.

The following communications were read:—

1. “On the Decapod Crustaceans of the Oxford Clay.” By James Carter, Esq., F.G.S., &c.

The Author commented on the paucity of these fossils as indicated in British lists, only three or four species having hitherto been recorded.

The discovery of considerable numbers of Decapod Crustaceans in the Oxford Clay of St. Ives has enabled the Author to increase the list materially. Many have been collected by Mr. George, of Northampton. These fossils occur in the clay immediately beneath the St. Ives rock, and therefore presumably in the uppermost zone of the Oxford Clay. Many of the specimens are more or less mutilated, but some fifteen or sixteen distinct species have been made out. None of these have been recorded as British except *Eryma Babeaui*, mentioned by Mr. Etheridge as having been found in the Kimmeridge Clay. Seven species are identified as foreign forms, and seven are new to science. They are distributed as follows:—

Eryon	1	species.
Eryma	5 or 6	„
Glyphea	2	„
Magila	2 or 3	„
Mecochirus	2	„
Goniochirus	1	„
Undetermined	3	„

Nearly all the forms belong to the type of the *Macrura*, the *Brachyura* being doubtfully, if at all, represented.

2. “On a new Emydine Chelonian from the Pliocene of India.” By R. Lydekker, Esq., B.A., F.G.S.

The Author described the shell of an Emydine Tortoise from the Siwaliks of Perim Island, Gulf of Cambay, which he regarded as decidedly distinct from any of the previously-described Siwalik species, and proposed to refer to the genus *Clemmys*, with the name of *C. Watsoni*, in compliment to the donor of the specimen.

November 3, 1886.—Prof. J. W. Judd, F.R.S.,
President, in the Chair.

The following communications were read:—

1. “On the Skull and Dentition of a Triassic Saurian, *Galesaurus planiceps*, Ow.” By Sir Richard Owen, K.C.B., F.R.S., F.G.S., &c.

The Author referred to a fossil skull from the Triassic sandstone of South Africa, which combined dental characters resembling those of a carnivorous Mammal with the cranial structure of a Saurian. The structure was described and figured in Owen’s ‘Catalogue of the Fossil Reptilia of S. Africa,’ under the generic title of *Gale-*

saurus, as belonging to a distinct suborder of REPTILIA, termed *Theriodontia*.

The characters of the skull and teeth of the original specimen of *Galesaurus* have been brought to light by further development.

In both the type specimen and that lately received the reptilian nature of the fossil is indicated by the single occipital condyle and other features. The chief difference from a mature male of a placental or marsupial carnivore is the evidence of a primordial "gullet-tract." Further details as to the structure of the skull were given, more especially with reference to the orbits and nasals. The palatal region repeats the same general characters as in previously described Theriodonts. The angle of the jaw is not produced, as in the crocodile, beyond the articular element. In general shape and bony strength the mandible of *Galesaurus* resembles that of a mammal.

The dentition is so much better preserved in the new specimen than in the type *Galesaur* as to call for description and illustration. In four of the upper molars the entire crown is preserved; it shows less length and greater breadth than appears in the previous restoration, is moderately curved externally, and triangular; the base is flanked by a short cusp before and behind, and the corresponding margins are finely crenulate, as in the molars of *Cynotraco*. The incisors are eight in number in both upper and lower jaws, four in each premaxillary, opposed or partially interlocking with the same number in each mandibular ramus; they have longish, slender, simple-pointed crowns. The canines, one on each side of both upper and lower jaws, have the same lanariform shape and size of crown as in the original fossil. In the right maxillary bone the long deeply planted root is exposed; the corresponding part of the lower canine is similarly exposed in the left mandibular ramus. No trace of successional teeth, as in ordinary Saurians, has been found.

Both Crocodiles and Alligators have two or more teeth of canine proportions; but the Author shows how they differ from those of mammalian carnivores and *Galesaurus*. A similar character and disposition of destructive canines is shown by the fossil jaws of the oolitic great extinct carnivorous Saurians, e. g. *Megalosaurus*. In the Triassic Labyrinthodonts the destructive and prehensile lanarities would by position rank as incisors rather than canines. In existing Lizards the dental series has more uniformity, and the cement-clad roots contract bony union with the jaw-bone. In *Galesaurus* the teeth, besides being distinguished, as in Mammals, by their differential characters, are implanted freely in sockets, the cold-blooded character being chiefly manifested in the greater number of teeth following the canines, and in their want of distinction.

Lastly the Author remarked on the earlier reptilian character shown by the oolitic Mammal *Amphitherium*, and also by the existing Australian *Myrmecobius*. He speculated on the degree of resemblance manifested by the teeth of the old Triassic Reptile of South Africa with the exceptional characters of some of the low Australian forms of Mammals.

2. "The Cetacea of the Suffolk Crag." By R. Lydekker, Esq., B.A., F.G.S., &c.

This paper commenced with notices of previous contributions to the subject by Sir R. Owen, Prof. Ray Lankester, Prof. Huxley, and Prof. Flower. In the preparation of a catalogue of the specimens in the British Museum, the Author had had occasion to examine the collection of Cetacea from the Crag, not only in that Museum, but also in the Museum of Practical Geology, that of the Royal College of Surgeons, and in the Ipswich Museum, besides visiting the collections at Brussels. In consequence several additions to the fauna and also numerous emendations of specific names were noticed in the paper now laid before the Society. Prof. Ray Lankester's views as to the Diestian affinities of the English-Crag Cetacea were confirmed by this comparison.

Detailed notes on the specimens examined and the species identified were given. The following list of the species believed to be represented in the various collections mentioned was given at the conclusion of the paper:—

BALÆNIDÆ.

Balæna affinis, <i>Owen</i> .	Balænoptera borealina, <i>van Beneden</i> .
— primigenia, <i>van Beneden</i> .	— emarginata (<i>Owen</i>).
— insignis (<i>van Beneden</i>).	Cetotherium Brialmonti (<i>van Beneden</i>).
— balanopsis (<i>van Beneden</i>).	— dubium (<i>van Beneden</i>).
Megaptera affinis, <i>van Beneden</i> .	— Hupschi (<i>van Beneden</i>).
— similis (<i>van Beneden</i>).	— brevifrons (<i>van Beneden</i>).
— minutus (<i>van Beneden</i>).	Herpetocetus scaldiensis (<i>van Beneden</i>).
Balænoptera definita (<i>Owen</i>).	— Goropi, <i>van Beneden</i> .

PHYSETERIDÆ.

Eucetus amblyodon, <i>du Bus</i> .	Choneziphius planus (<i>Owen</i>).
Homocetus Villersi, <i>du Bus</i> .	— Packardi, <i>Lankester</i> .
Balænodon physaloides, <i>Owen</i> .	Mesoplodon longirostris (<i>Cuvier</i>).
Physodon grandis (<i>du Bus</i>).	— tenuirostris (<i>Owen</i>).
— fusiformis? (<i>du Bus</i>).	— gibbus (<i>Owen</i>).
Hoplocetus crassidens, <i>Gervais</i> .	— angustus (<i>Owen</i>).
— borgehoutensis, <i>Gervais</i> .	— angulatus (<i>Owen</i>).
— crassidens?, <i>Gervais</i> .	— compressus (<i>Huxley</i>).
Hyperoodon, sp.	— Floweri, <i>Canham, MS</i> .
Choneziphius planirostris (<i>Cuvier</i>).	

SQUALODONTIDÆ.

Squalodon antverpiensis, *van Beneden*.

DELPHINIDÆ.

Orca citoniensis, <i>Capellini</i> .	Delphinoid genus, non det.
Globicephalus uncidens (<i>Lankester</i>).	

3. "On a Jaw of *Hyotherium* from the Pliocene of India." By R. Lydekker, Esq., B.A., F.G.S., &c.

Colonel Watson, the Political Resident in Kattiawar, had recently sent to the Author a fragment of a left maxilla with the three true molars from Perim Island, in the Gulf of Cambay. The specimen belonged to *Hyotherium*, and apparently to an undescribed species,

the differences between which and the several forms previously known from various European and Asiatic beds were pointed out. The Author also called attention to the peculiar association of types found in the beds of Perim Island, and to the affinities of the genus *Hyotherium* with the recent *Sus* and *Dicotyles* on the one hand, and with the Upper Eocene *Chæropotamus* on the other.

December 1, 1886.—Prof. J. W. Judd, F.R.S.,
President, in the Chair.

The following communications were read:—

1. "On a new Genus of Madreporaria—*Glyphastræa*, with remarks on the *Glyphastræa Forbesi*, Edw. & H., sp., from the Tertiaries of Maryland, U.S." By Prof. P. Martin Duncan, M.B., F.R.S., F.G.S., &c.

The specimens of *Septastræa Forbesi*, Edw. & H., were examined many years ago, and the Author had always a doubt about their generic position. Lately a very well-preserved specimen has been received, which when compared with those in the National Collection and carefully studied, is found to have a columella and a remarkable dome of endotheca at the top of the base of the calicular fossa, resembling the well-known structure in *Clisiophyllum*.

Two opposite primary septa become very narrow, extend inwards, form, with another structure, a narrow linear columella, and thus produce the appearance of a continuous lamella. The other primaries and some of the secondary septa reach this long structure, and the endotheca stretches between the ends of the septa, their sides, and the columella, and closes up the interseptal loculi. The epithecal dissepiments are dome-shaped at the base of the calice, and are ornamented with sparsely distributed granules: superficially a corresponding granulation occurs on the narrow and also on the wide marginal parts of the septa.

There is a groove between the calices, and it corresponds with the imperfect junction of the corallite walls. Fissiparity occurs and also gemmation.

Natural sections show a narrow ribbon-shaped columella.

The examination of the perfect specimens proves that whilst they cannot be understood without sections, sections alone would never enable the palæontologist to realize the elaborate superficial structures. It was pointed out that weathering utterly destroyed the generic and specific characters, and the Author ventured to caution the students of the Madreporaria against describing weathered and worn specimens of any types, and not to depend entirely upon sections.

The new genus *Glyphastræa* includes *Astræidæ* of the *Goni-astræoid* alliance with fissiparity, gemmation, and a ribbon-shaped columella. *Septastræa Forbesi* becomes *Glyptastræa Forbesi*, Edw. & H., sp.

2. "On Fossil Chilostomatous Bryozoa from New Zealand." By Arthur Wm. Waters, Esq., F.G.S.

The fossil Bryozoa described in the present paper are from the localities of Petane, Waipukurau, Wanganui, and some simply designated as from the neighbourhood of Napier. The first three represent deposits of a well-known position, which was considered Miocene by Tenison-Woods, but which Professor Hutton (Quart. Journ. Geol. Soc. vol. xli.) has more recently called Pliocene. Some others, sent over as from "Whakati," are thought to be from Waikato.

The genus *Membranipora*, which is largely represented from near Napier, is not one of the most useful palæontologically, because the shape of the opesia opening only, and not the oral, is preserved, and also the appearance of the zoecia is often remarkably modified by the ovicells, which, however, are frequently wanting, and in many well-known species have never been found.

The Author pointed out that in the commoner and best-known species of Bryozoa the amount of variation is recognized as being very great, and considered that in the face of this there is too great a tendency to make new species on slight differences which may be local variations, and that even in some cases instead of the description referring to a species, it may be that only a specimen has been described.

A list of New-Zealand Bryozoa has been drawn up by Professor Hutton, and our knowledge of the New-Zealand and Australian Bryozoa is being constantly increased by MacGillivray, Hincks, and others; nevertheless enough is not yet known to fix the exact age by means of the Bryozoa alone, but the large number of species entirely identical with those living in the neighbouring seas, and the general character of the others, show that the deposits must certainly be considered as of comparatively recent date.

Out of the 78 species or varieties, 61 are known living, 29 of these from New-Zealand seas, 48 from either New-Zealand or Australian waters, and 28 have been found fossil in Australia. Judging from these alone, it would seem that some authors have assigned too remote an age to the deposits. The new forms described were:—

Membranipora occultata.	Porina grandipora.
Monoporella capensis, var. dentata.	Lepralia semiluna, var. simplex.
— waipukurensis.	— bistata.
Micropora variperforata.	Schizoporella cinctipora, var. personata.
Mucronella tricuspis, var. waipukurensis.	— tuberosa, var. angustata.
— —, var. minima.	Cellepora decepta.
— firmata.	—, sp.

December 15, 1886.—Prof. J. W. Judd, F.R.S.,
President, in the Chair.

The following communications were read:—

1. "Notes on *Nummulites elegans*, Sow., and other English Nummulites." By Prof. T. Rupert Jones, F.R.S., F.G.S.

The Author finds in the "Sowerby Collection," now in the British

Museum, the original specimens on which Sowerby founded his *Nummularia elegans* (1826, Min. Conch. vol. vi. p. 76). These are partly specimens from that part of the bed "no. 29" of Prof. Prestwich's section of Alum Bay (Quart. Journ. Geol. Soc. vol. ii. (1846) p. 257, pl. ix. fig. 1) which is known to be the lowest of the Barton series, and partly some in a stone said to be from Emsworth, in Hampshire. The former are the same as those named *Nummulites planulata*, var. *Prestwichiana*, by Rupert Jones in 1852; and the latter are *N. planulata*, Lamarek (1804), and probably foreign. Thus *N. elegans* has priority over *Prestwichiana*; and as this last was determined by De la Harpe to be a variety of *N. wemmelensis*, Van den Broeck and De la Harpe, this variety should be var. *elegans*. The Author thinks that, on broad zoological principles, *N. planulata* might still be regarded as the species; but, in view of the careful differentiation worked out by De la Harpe, he accepts the "specific" standing of "*wemmelensis*" as useful among *Nummulites*; but "*Prestwichiana*" has to give way to "*elegans*" for the peculiar "Barton" variety. A bibliographical history of the long-misunderstood *N. elegans*, Sowerby, descriptions of this form and of *N. variolaria* (Lam.), notes on *N. levigata* (Brug.), and an account of their range in England completed the paper.

2. "On the Dentition and Affinities of the Selachian Genus *Ptychodus*, Agassiz." By A. Smith Woodward, Esq., F.G.S.

The genus *Ptychodus*, owing to the detached condition in which the teeth are usually found, has hitherto been imperfectly understood. Agassiz referred it to the Cestraciontidae on account of a supposed resemblance in the arrangement of the teeth, and Owen's researches on their microscopic structure served to confirm this view. On the other hand, several writers have pointed out characters tending to show affinity between *Ptychodus* and *Rhynchobatus*.

More recently, however, Prof. Cope and the Author had shown that the supposed affinities between *Ptychodus* and the Cestraciontidae were only apparent, and in the present paper additional evidence was brought forward.

The Author proceeded to describe several specimens of *P. decurrens* in the British Museum, and in the collection of Mr. H. Willett, of Brighton, one of the latter, especially, containing, what had been previously entirely unknown, the dentition in part of both jaws. These specimens showed that each jaw contained six or seven longitudinal rows of teeth on each side of the median row, and that the genus must be referred to the true Rays and not to the Cestracion Sharks, though the precise family to which *Ptychodus* belongs was more difficult to determine. On the whole the writer was disposed to assign it a place either amongst the Myliobatidae or in their neighbourhood. The microscopic structure of the teeth was shown to be insufficient, by itself, to show their affinities.

3. "On a Molar of a Pliocene type of *Equus* from Nubia." By R. Lydekker, Esq., B.A., F.G.S.

A small collection of Mammalian remains from near Wadi Halfa had recently been placed in the Author's hands; some of the bones were mineralized similarly to those of the Upper Pliocene of the Val d'Arno, or the Lower Pleistocene of the Narbadá valley. Amongst others the most interesting is a right upper cheek-tooth of *Equus* but little worn. It evidently does not belong to any of the late Pleistocene or Recent species of the genus, but to the more generalized group comprising *E. sivalensis*, &c.; though, bearing in mind the impossibility of distinguishing many of the existing species of the genus by their teeth alone, its absolute specific identity is not asserted. We may infer, then, that the ossiferous beds of Wadi Halfa are not improbably of Pliocene age, since this group of Horses, both in Europe, Algeria, and India, had totally disappeared after the period of the Forest-bed. Moreover, it is of interest, in view of previously expressed opinion, to find in the Tertiary of Nubia a species of this primitive group of *Equus* which is apparently more nearly allied to the Siwalik than to the European species.

January 12, 1887.—Prof. J. W. Judd, F.R.S.,
President, in the Chair.

The following communications were read:—

1. "The Ardtun Leaf-beds." By J. Starkie Gardner, Esq., F.G.S., F.L.S.; with Notes by Grenville A. J. Cole, Esq., F.G.S.

The description of these beds by the Duke of Argyll thirty-five years ago indicated that enormous tracts of Trap in the Inner Hebrides were of Tertiary age. Prof. Edward Forbes, who described the leaves, inclined to the idea that they might be Miocene; but in estimating the value of this conjecture, we must remember that at the time the existence of Dicotyledonous leaves of similar aspect, but of undoubtedly Cretaceous age, was quite unsuspected, and that no typical Eocene flora had then been properly investigated or described. Prof. Heer, however, adopted the opinion that the age of this formation was Miocene, and unfortunately extended its application to formations containing similar floras in Greenland and elsewhere. One object of the present communication is to show that, instead of belonging to the Miocene, these floras are of Eocene age, and in fact older than the Thanet beds. The other object is to redescribe the plant-beds, and to show that they are part of a rather extensive series of sedimentary rocks intercalated among the Traps.

The rapid accumulation of knowledge as to the distinguishing characteristics of Cretaceous, Eocene, and Miocene floras has rendered the attainment of the former object at least possible, and it is of the greater importance, since the error in determining the age of the fossil floras of Ardtun and Antrim, and of a part of the Arctic flora,

is a great impediment to further progress. Instead of all these immense thicknesses of beds belonging to the Miocene, they have their base somewhere in the so-called Cretaceous series; 400 feet higher up we are about the horizon of the Thanet Beds; while at 1000 feet up the flows were contemporaneous with the Bracklesham and Barton deposits. The first acid eruptions were Miocene, as shown by the floras preserved in Iceland.

The Author described the various exposures from his own observations and Mr. Cole's notes. At Ardtun the Traps are surmised to be parts of once continuous flows, still represented at Staffia and Burgh, but broken through by an intrusive sheet. The leaf-beds are varied in composition, the richest being very friable, while the best matrix is a limestone as fine as lithographic stone, in which plant-remains are few, but exquisitely preserved. They are overlain by thick deposits of river-gravel, chiefly composed of flint or silicified chalk, but in which Mr. Cole has detected fragments of sanidine like that of Ischia or the Rhine, and of trachyte. At Carsaig the gravels are coarser and less evenly bedded, and the sandy matrix apparently is entirely made up of flint. The coarse gravels are flanked by sands and indicate a rapid flow of water, occupying a valley not less than a mile across. The Ardtun gravels indicate a less rapid but more extensive river. The section at Burgh is very like that at Ardtun, with the addition of an extensive ash-bed at the base, with sand instead of gravel, and with many hundred feet of Trap above. In the Wilderness there is a small outcrop of Chalk-rubble, less than 300 square feet in extent, and evidently redeposited. Some distance under this is Greensand *in situ*, then Lower Lias, and lastly Poikilitic sands. This descriptive part of the paper concluded with some remarks on the estuarine formation between the Chalk and Upper Greensand at Beinn Jadain in Morven, which the Author investigated in the hope of finding plant-remains belonging to that interesting age. He doubts that the Chalk is *in situ*, and considers the evidence of age to be not quite conclusive.

The second part of the paper dealt with the Palæontological evidence. The evidence, if confined to the plants of Ardtun, was said to be scarcely worth serious discussion, and the analysis was extended to the far richer plant-bed at Atanekerdluk. The identifications of these with Miocene plants of Europe were discussed *seriatim*, and shown to be groundless, or only applied to such prevailing types of leaves as are common to widely distinct genera, and occur in floras recent as well as fossil, and which cannot be superficially distinguished in even a living state. The strong resemblance and even identity of the best-characterized forms with the older Eocene plants has been, on the other hand, hitherto ignored. The most strongly marked types of Greenland, and which recur in Antrim, are met with in the Heersian of Gelinden and at no other horizon, and amply suffice to fix the date of the Antrim floras. The Mull flora, as its aspect indicates, is still older, and consequently earlier than the Thanet Beds of England. Independently of positive evidence, the absence of any late Tertiary types, even of the Legu-

minosæ, which abound as low down as the Reading Beds, sufficiently indicates their extreme antiquity.

2. "On the Echinoidea of the Cretaceous Strata of the Lower Narbadá Region." By Prof. P. Martin Duncan, M.B., F.R.S., F.G.S.

A collection of fossils from the limestone near Bág, in Western India, made by Colonel Keatinge, was described by the Author in the Quarterly Journal of the Society for 1865, and shown to be of Upper Greensand or Cenomanian age. The country was subsequently examined, and a sketch-map made by Messrs. Blanford and Wynne, who found near Bág the following beds in descending order beneath the Deccan and Malwa traps:—

Coralline limestone.
Argillaceous limestone.
Nodular limestone.
Sandstone.

All were conformable, the whole thickness of limestone did not exceed 50 feet, and the fossils obtained by Colonel Keatinge were shown to have been exclusively derived from the Argillaceous limestone. All the beds were referred to the same Cretaceous subdivision.

Good topographical maps having been prepared, the area was remapped by Mr. Bose, who obtained several additional fossils from the Coralline and Nodular limestones, and a few from the upper beds of the sandstone. He accepted the Cenomanian age for the Argillaceous limestone, but referred the overlying Coralline limestone to a Senonian age, and the underlying Nodular bed to the Gault, whilst he regarded the sandstone at the base as probably Neocomian.

Mr. Medlicott, Director of the Geological Survey of India, in compliance with the author's request, had sent to him the Echinoidea collected by all the geologists named, and, on examination, the collection was found to comprise the following eight species:—*Cidaris*, sp. nov., *Salenia Fraasi*, *Cyphosoma cenomanensis*, *Orthopsis*, sp. nov., *Echinobrissus Goybeti*, *Nucleolites similis*, var., *Hemiaster cenomanensis*, and *H. similis*. All the known forms were found in beds of Upper-Greensand age in the Lebanon, Europe, &c., except the *Nucleolites*, which was a Chloritic-marl species. Of the eight species all were found in the Argillaceous limestone, five in the Coralline, and two in the Nodular limestone, the last two, *Hemiaster cenomanensis* and *H. similis*, occurring throughout. Under these circumstances there appeared no reason for assigning the beds of limestone to different stages of the Cretaceous system.

3. "On some Dinosaurian Vertebræ from the Cretaceous of India and the Isle of Wight." By R. Lydekker, Esq., B.A., F.G.S.

The Author, in 1877, described some Dinosaurian caudal vertebræ and a femur from the Lameta beds of India (Middle or Upper Cretaceous), and as he was unable to find any described forms that

resembled them, he proposed for them a new genus, which he called *Titanosaurus*. Two species were represented. After noticing the principal characters of the Indian specimens, he showed that some caudal vertebræ in the British Museum, collected by the late Mr. Fox from the Wealden of Brook, in the Isle of Wight, agreed in form with those found in India and were, in fact, intermediate in some respects between the two Indian species. An inquiry into the associated remains at Brook indicated that the caudal vertebræ in question probably belonged to *Ornithopsis*, and this probability was supported by the structure of certain American fossil genera placed by Marsh in the same suborder, Sauropoda, of the Dinosauria. In any case there is great probability that at least one of the Indian and the Isle of Wight vertebræ should be referred to the same genus.

Some other instances of fossil vertebrates appearing in Indian beds of a rather later geological age than in Europe were noticed.

MISCELLANEOUS.

On Lernæascus nematoxys, a hitherto unknown Lernæan.

By Prof. C. CLAUß.

BENEATH the scales, especially of the pigmented side, of *Solea monochir* there lives a vermiform parasite 8–10 millim. long, which, when examined by the naked eye, resembles a small Nematode; it glides to and fro by means of slight bendings of its body, after the fashion of the mining caterpillars, in short, narrow, mucous canals. Closer examination, however, shows that we have to do here with a female Lernæan, which has taken on a worm-like form in accordance with its dwelling-place, and has acquired several exceedingly remarkable adaptations. The anterior and posterior extremities of the body taper off gradually, the former easily recognizable by the insertion of the antennæ, the latter by the two fureal processes. As may be seen from the position of the two oviducal apertures, only the extreme hinder end, scarcely 1 millim. long, represents the abdomen; the preceding division of the body, which is nearly ten times as long, with the nervous centre, middle intestine, ovaries, and cement-glands, represents the cephalothorax. On the cephalic part of this the anterior, setigerous, tactile antennæ are inserted; and ventrally the prehensile antennæ, which terminate in strong hooks. The tripartite entomostracal eye is perfectly retained. The mouth-organs consist of a sucking-proboscis armed with two reversed hooklets, and of two powerful foot-jaws. The mandibles are aborted, and the stylet-bristles placed outside of the proboscis are to be regarded as maxillæ. There are three pairs of limbs consisting of minute rudimentary feet originating far apart; the first two pairs are still recognizably biramosc; the feet of the last pair